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DEVELOPMENT OF STUDENT WORKSHEET WITH SCIENTIFIC APPROACH ORIENTED TO PRACTICE PROBLEM-SOLVING SKILL ON REACTION RATE TOPIC

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ABSTRAK

Tujuan dari penelitian ini adalah untuk mengetahui kelayakan Lembar Kegiatan Siswa Berorientasi Pendekatan Saintifik untuk Melatihkan Keterampilan *Problem Solving* pada Materi Pokok Laju Reaksi. Selain itu penelitian ini juga bertujuan untuk mengetahui aktivitas siswa, keterampilan *problem solving* yang dilatihkan, serta respon siswa terhadap LKS yang dikembangkan. Metode penelitian yang digunakan adalah metode *Research and Development* (*R & D*) oleh Sugiyono (2012). Instrumen yang digunakan adalah lembar telaah, validasi, observasi aktivitas siswa, *test* keterampilan *problem solving*, dan angket respon siswa. Sumber data yang diperoleh dalam penelitian ini adalah berasal dari 3 dosen kimia sebagai penelaah sekaligus validator, 2 guru kimia sebagai validator, dan 12 siswa kelas XI SMA. Berdasarkan hasil validasi yang dilakukan terhadap LKS yang dikembangkan diketahui bahwa rata-rata presentase yang diperoleh secara keseluruhan adalah 82% atau sangat layak. Sementara itu untuk aktivitas siswa selama kegiatan pembelajaran menggunakan LKS menunjukan sebesar 83,8% siswa yang melakukan aktivitas relevan sedangkan 16,2% tidak relevan. Keterampilan *problem solving* telah terlatihkan pada siswa dengan rata-rata *n-gain score* yang diperoleh selama 4 pertemuan adalah 0,8 atau berada pada tingkat tinggi. Rata-rata persentase respon siswa terhadap kelayakan LKS yang dikembangkan adalah sebesar 76,8% atau layak.

Kata kunci: Lembar Kegiatan Siswa, Pendekatan Saintifik, Keterampilan *Problem Solving*, Laju Reaksi.

ABSTRACT

This study was aimed to know the feasibility of Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill on Reaction Rate Topic. Furthermore, it also to know the activities of students, problem-solving skill, and response of students to them The method used is Research and Development (R & D) method by Sugiyono (2012). The instruments include review, validation, student activity observation, problem solving test skill sheet, and the student responses questionnaire. Source of data in this study are from 3 chemistry lecturers and 2 chemistry teachers, and 12 students. Based on the results of the validation of developed student worksheet is known that the average percentage obtained is 82% or highly feasible. Meanwhile for student activity during using worksheets is 83.8% of students who do relevant activities, while 16.2% not relevant activities. The problem solving skills practiced in students with an average of n-gain score was 0.8. So the problem-solving skill is in high level. Average percentage of student's response is 76.8% or in a feasible criteria.

Keywords: Student Worksheet, Scientific Approach, Problem Solving Skills, reaction rate .

INTRODUCTION

The curriculum 2013 aims to prepare Indonesian to have the ability to live as individuals and citizens who believe, productive, creative, innovative, and affective and able to contribute to the society, nation, state, and world civilization **[1].**

In other words the curriculum 2013 is to create a Human Resources who can contribute in advancing the nation. Due to the quality of the individuals who build the nation which became the determining for future direction of the nation later. Furthermore, over the time by time now people are required to have high competence to be able to compete well. Therefore, it will be necessary for qualified human resource development efforts through education quality as well **[2].**

One indicator of the success of learning chemistry is students have the ability to resolve the problems by faced it, either in the form of questions and problems that come from daily life. Similarly, Gagne opinion that the core of education is to teach students to think, to use their rational powers, and become a good problem solver [3]. Jonassen argued that there are four reasons why problem solving the main focus of learning, such as: (1) authentically, every individual in daily life is always faced the problem; (2) relevance, a problem that was shown have relevance to motivate students to learn; (3) The problem solving requires deep learning; (4) knowledge is constructed of problems that were presented to make learning more meaningful **[4].**

Examples of problems that can be found by students in daily life like the problems related to chemistry. Due to the chemistry as one of the disciplines of science group that also explains natural phenomenon that occur in the daily life. Such as chemical phenomenon that directly related with the matter surround us like a rusty nail, the color of foliage change become yellow, decomposition, and many other events **[5].** Thus of the opinion can be concluded that in chemistry there are many problems that need to be solved systematically.

One of chemistry learning matter that will be learned by the students from Senior High School is reaction rate. Reaction rate is one of the chemical concept that be represented into three levels. They are submicroscopic, macroscopic, and symbolic level. Reactant when reacting through collision mechanism (submicroscopic level) then become a product which can describe through reaction equation (symbolic level). It will be indicated by gas, change of color and the temperature present (macroscopic level) **[6].**

Based on the fact preliminary study in SMAN 1 Karang Anyar that found in Fitri Herawati's study about student achievement of reaction rate subject. It shows that result of examination of reaction rate topic is obtained score average 68.25, low achievement. Even the mastery leaning that must be achieved is 75. Then the percentage of students who has passed the mastery learning of that matter is just 50% **[7].**

Those explanation reinforced by the results of a questionnaire distributed at SMAN 18 Surabaya on February 26, 2015 as many as 64.3% of respondents considered the reaction rate material is material that is difficult to understand and vice versa by 35.7% of respondents do not

have difficulties when studying that matter. 75% of respondents said that they find it difficult because of the media being used less attractive and the remaining 25% said teachers are less obvious explanation. It can be concluded that the material reaction rate from periodic time is always considered by students as one of the difficult material in chemistry.

The gap which is come from those facts and the expectations, can be handled with the media that is expected to practice problem solving-skill of students in reaction rates subject. Media that will be developed in this study is student worksheet. Because according to Sriyono (1992) student worksheet is one kind of program that is based on tasks to be completed and the benefit using it is to transfer knowledge and skill to accelerate the growth of student's interest to the participating in the learning process **[8].**

That explanation contrary with the obtained fact after having interview with one of chemistry teacher at SMAN 18 Surabaya. She said that the worksheets used when the reaction rate topic is the worksheets that contain exercises only. It can be concluded that the reason why students feel difficulty with the reaction rate topic is because of one of the worksheets used for understanding and facilitating the reaction rate subject, especially on the topic of the factors that affect the reaction rate.

Therefore it needs an approach for student worksheet as a bridge problem-solving skill in order to the students to be practiced. Student worksheet use the scientific approach that will be developed strongly supported by standard processes that have previously been mentioned in the annex of Permendikbud Processing Standards number 65 on Primary and Secondary Education that the need for a learning process that is guided by the principles of scientific approach. The scientific approach is a learning process that uses a scientific thought process. And scientific approach can serve as a bridge for the development and the development of attitudes, skills, and knowledge of learners **[9].**

Based on these facts, the authors had the idea to develop chemistry student worksheet to practice problem solving-skill in reaction rates topic with a scientific approach.

Therefore, the author would like to compile a study entitled "Development of Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill on Reaction Rate Topic "

METHOD

The type of this study is development research. Design of this study is research and development (R & D) model which is adapted by Sugiyono (2012). Steps being taken in this study were (1) a preliminary study, (2) the design of the product, (3) study the product, (4) the revision of the products, (5) validation of the product, and (6) limited trial **[10].**

The targets from this study is the chemistry student worksheet scientific approach oriented to practice problem solving skill in reaction rates subject.

Source of data in this study come from three lectures of chemistry, 2 chemistry teachers and 12 students of class XI MIA.

Data collection methods in this study is questionnaire method,

observation method, and test methods.

The instrument used to measure in this study is the reviewing sheet, validation sheet, student activity observation sheets, test sheets, and student questionnaire responses.

Validation of data obtained from 4 validator which is composed of two lectures of chemistry department and 2 chemistry teacher then descriptive quantitatively analyzed by using the following calculation formula:

$$P\% = \frac{Number\ of\ score\ obtained}{criterian\ score}$$

Since,
P%= percentage of score obtained of validation results

Feasibility percentage obtained from analysis of the validation data then interpreted into a Likert scale with the provisions of Student Worksheet is feasible if the percentage viability of any feasibility criteria were obtained **[11]**.

While it is to analyze the activity of observation data is calculated by the following formula:

$$P\% = \frac{Number\ of\ active\ student}{total\ of\ student\ in\ limited\ trial}\ x\ 100\%$$

[12]

Analyzing test results problem solving skill of students in reaction rate topic can be interpreted the scale score by Riduwan (2010). Additionally n-gain score also was calculated to determine the level of students' problem solving skill by using the following formula:

$$\langle g \rangle = \frac{\%\langle G \rangle}{\%\langle G_{maks} \rangle} = \frac{(\%\langle S_f \rangle - \%\langle S_i \rangle)}{(100\% - \%\langle S_i \rangle)}$$

Since,

$\langle g \rangle = n$ormalized gain score

$\%\langle S_f \rangle =$ persentage of post test score

$\%\langle S_i \rangle =$ percentage of pre − test score

Further figures obtained converted by category as seen in table 1:

Table 1. Category of Scale Normalized gain score

Scale normalized gain score	Level
g > 0,7	High
0,7 < g < 0,3	Medium
g < 0,3	Low

[13]

Results of the questionnaire responses provided to the students about developed Student Worksheet then calculated using the following formula:

$$P(\%) = \frac{F}{N}\ X\ 100\%$$

Since,
P = the percentage of respondents
F = number of yes / no answer from the respondent
N = number of respondents

The percentage obtained is then interpreted into Riduwan assessment scale (2010). Student worksheet developed will be feasible if the percentage obtained for each criteria of 61%.

RESULT AND DISCUSSION

1) Based on the results of the validation conducted by two professors of chemistry and 2 chemistry teacher, Student Worksheet oriented scientific

approach to problem solving skills melatihkan the topic matter of the reaction rate gain an overall percentage of 81.75% is categorized as very feasible with the details in Table 2 below:

Table 2. Validation Result of Student Worksheet

Aspect	**Score percentage (%)**	**Criteria**
Suitability with scientific approach Criteria	82	very feasible
Suitability with problem solving-skill Criteria	81	very feasible
Presenting Criteria	82.5	very feasible
Language Criteria	82.5	very feasible
Material Criteria	82.5	very feasible
Illustration Criteria	80	Feasible
Average	**81.8**	**very feasible**

a) The Suitability with Scientific Approach Criteria

Based on the feasibility criteria of suitability with scientific approach very feasible. It shown by the obtained percentage for this criterion is 82%. That number shows that the scientific approach as a primary identity in worksheet developed highly visible and can help support the learning of the scientific approach.

b) Based on results of the validation of the conformance criteria developed Student Worksheet get a percentage viability of 81%. So Student Worksheet developed based on these criteria is very feasible. This shows that component of any problem solving skills to be trained so clearly visible in every feature Student Worksheet.

Problem solving skills component of the aspects of evaluation criteria is problem solving proposed by Bansford and Stein (1993), the IDEAL problem solving. IDEAL drilled problem solving consists of identifying problems, defining objectives, selecting the appropriate problem solving strategies, conduct problem solving strategies, and re-check problem solving.

c) Based on the criteria developed Student Worksheet presentation shows that student worksheet very feasible with the eligibility percentage obtained for 82.5%. Acquisition of this figure shows that in terms of the layout of text, images, tables, as well as a systematic presentation of the concept of inter-sub-themes, and the presentation can emphasize the problem solving skills very well.

d) Language Criteria

Language criteria of developed Student Worksheet in this study gain feasibility percentage 82.5%. This proves that language presented in the Student Worksheet is very

communicative, a good use of language and suitability, orderly meaning, or a term in the Student Worksheet is also very good. So Student Worksheet on language criteria said to be very feasible.

e) Material/Content Criteria

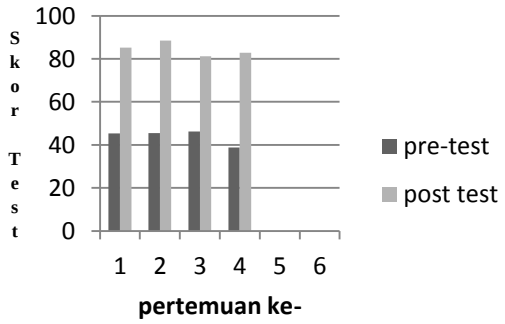
Feasibility for material/content criteria on developed student worksheet showed that feasibility of material criteria percentage is 82.5% or very feasible category. This proves that the material presented in Student Worksheet is highly relevant to core competencies, basic competencies, and also learning objective. Besides the topic matter have been suitable with to the structure of science.

f) Based on the validation results of illustration criteria shows that criteria of developed worksheet said to be in feasible category with the acquisition of a percentage of 80%. This proves that the illustrations or pictures are relevant to the topic matter. Besides that, it can clarify the concept.

2) The results of student activity observation

obtained from the observation that students are very active during the learning activities using the worksheets developed.

This is evidenced by the percentage of students who do relevant activities is 83.8% and 16.2% of students do activities that are not relevant.



3) Problem solving skills test results

The level of student's problem-solving skill can be known through the acquisition of n-gain overall score is 0.8. This shows that the problem solving skills of the students have reached high levels during the 4 meetings. So that problem solving skill already successfully to be practiced to students during the learning activities using worksheets developed.

4) Results observation student response

After knowing the theoretical feasibility through the validation results given by the four observers, the feasibility empirically developed Student Worksheet is determined by the response of students who join to the limitation test in this study. The responses show that developed student worksheet is feasible. It proved by the percentage that obtained from student is 76.2%.

CLOSURE

Conclusion

After analyzing the study data and a discussion of the results of study was concluded for Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill Reaction Rate Topic is as follows:

1. The theoretical feasibility of Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill Reaction Rate Topic in terms of the results of the validation performed by four percentage validator obtain eligibility criteria for the material / content, presentation, language, illustration, suitability with the scientific approach, and suitability with the problem solving skills is 81.8%. So based on theoretical feasibility indicates that the developed worksheets is very feasible.
2. Students who are active in the relevant activity during the test Student Worksheet Scientific Approach Oriented to Practice Problem Solving-Skill on Reaction Rate Topic during the four meetings was 83.8%. While students who perform activities that are not relevant amounted to 16.2%.
3. Problem-solving skill are practiced to students when using the Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill Reaction Rate Topic obtain n-gain overall score of 0.8 for four meetings. So that problem solving skills that are trained at a high level.
4. Empirical feasibility of Student Worksheet Scientific Approach Oriented to Practice the Problem-Solving Skill Reaction Rate Topic in terms of the percentage of students achieve response to the criteria of the material / content, presentation, language, illustration, suitability with the scientific approach, and suitability with problem solving skills is by 76.2%. So that eligibility is based on empirical developed Student Worksheet feasible.

Suggestion

1. The study of Development of Student Worksheet Scientific Approach Oriented to Practice Problem-Solving Skill on Reaction Rate Topic is over until limited test level. Therefore, it necessary to do for next study in order to publish this worksheet wider.
2. The limitation of time can be found when the problem solving will be practiced in class. Actually, it can be hold by practice the problem solving skill more frequently to the student in every lesson matter.
3. The teacher have to able to manage students in the changing climate class.

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